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ABSTRACT

To provide more information on whether computer assisted instruction (CAI) is an effective means of reading remediation, a study examined two ninth grade classes (15 students per class) to determine what differences, if any, existed after remediation of the experimental sample's deficiencies with CAI. The classes were primarily Black, with four Hispanic students and one Vietnamese student, from an urban-suburban community. Both the control and experimental samples were pretested with the High School Proficiency Test (HSPT). The control sample received direct instruction in a classroom setting for five 43-minute periods per week, while the experimental samples received three 43-minute periods of direct instruction plus CAI for two 43-minute periods per week. Results from a posttest indicated that the experimental sample showed no significant difference when contrasted with the control sample, and that the control group showed a mean gain of two points over the experimental sample. (Two tables listing the mean, standard deviation, and t of the pretests and posttests for the experimental and control groups are included, and tables of the pretest and posttest results of the two groups, a skills array of HSPT reading specifications, and 26 references are appended.) (MM)

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The Effects of Computer Assisted Instruction on Reading

by

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of the Requirements for the Master of Arts Degree

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ABSTRACT

This study involved two ninth grade classes, each having fifteen students. The classes were primarily Black, with four Hispanic and one Vietnamese student from an urban-suburban community. It was hypothesized that the use of Computer Assisted Instruction with the experimental sample would show a significant difference in the posttest results of those students. The experimental sample received, in addition to three 43 minute periods of direct instruction, two 43 minute periods of computer assisted instruction. The control sample received only direct instruction for five 43 minute periods per week.

An analysis of the results indicated that the experimental sample, which received computer assisted instruction, showed no significant difference when contrasted with the control sample. In fact, the control sample showed a mean gain of two points over the experimental sample.

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I would also like to thank Dr. Mazurkiewicz for his guidance and patience throughout the project.

Thanks must also be given to the ninth grade students involved in the study. Without their cooperation and assistance, this project would have been impossible.

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Computer assisted instruction, (CAI) and its effects on reading has been a widely discussed topic among educators. Many aspects of computer assisted instruction have been examined. Initial work in CAI was begun by the Illinois Plato staff in 1960, and the Stanford Project, started in 1963, was the first to make use of CAI in reading at the Elementary school level. Marsh 1983). In this study both the control and experimental groups had similar reading scores prior to CAI. The average Stanford Binet Intelligence Test score was 89. The reading program included computer software as well as audio visual and tactile hardware, emphasizing comprehension practice and word attack skills.

Although the Stanford team felt the project was successful, Spache (1967-68) questioned whether learner and output variables had been taken into careful consideration. Sears and Shaftel (Shaftel 1967) noted a decline in social behavior among CAI students, and Smith (1971) wrote that "objectives are currently rather limited and the theory of reading underlying such problems is rarely evident or adequate."

Other studies that had positive results with CAI were done by Lysiak, Wallace and Evans (1976) , and studies done in Philadelphia and Chicago schools reported in Mason and Blanchard (1979 pp. 50-51),

Some projects did not result in statistically significant findings in favor of CAI. One was a Fort Worth study (Lysiak, Wallace and Evans 1976) and a 1976 University of Kansas comparison of basal textbooks and CAI teaching methods (Mason and Blanchard 1979 p. 95).

Chan (1983) suggests that computer programming is a good way to enhance comprehension skills such as details, sequence and organization, perceiving relationships, comparison and contrast, and predicting outcomes. She

also suggests that programming also develops children's writing skills.

Dudley-Marling (1985) focus on uses of the microcomputer that encourage the discovery that written language is meaningful, purposeful and worthwhile. Several programs, such as SNOOPER TROOPS (Snyder, 1982), DEADLINE (Blank, 1982), and WINDOW ON LEARNING: THE LEARNING MAGAZINE ON A DISK (Window, 1983) are among those recommended. Bradley (1981) states that there is some evidence that using computers may result in longer language experience stories and more revision.

Currently available software, however, seems to be limited. Most available software is concentrated in word attack and comprehension, and few materials in the areas of study skills and recreational reading are available.

Simon (1983) feels that although some useful things have been done, CAI has really made no substantial difference to the educational system. He feels that although some useful programs have been developed in the areas of drill and practice, CAI has not made a great impact. He states that what has been done so far is basically just putting programmed text on a computer.

Simon also points out that as of yet we have no way of disseminating computer software the way texts are now disseminated.

Yeager (1977), also of the PLATO project, expresses the need for experts in the field of reading to aid in the development of CAI materials, which have thus far been developed by people who have little or no background in reading.

A number of comparisons of achievement, CAI versus paper and pencil workbook activities have been done. All suggest that CAI is no more

effective than traditional procedures. Few studies, however, exist on remediation by CAI, and none at the High School level.

The problem of whether or not CAI at the High School level is an effective means of remediation is an important one since so many students exist who achieve poorly in reading by graduation. Would there be a difference between students' performance with and without CAI?

To provide more evidence on the topic, a study was conducted with two ninth grade classes to determine what differences, if any, would exist after remediation of one samples' deficiencies with CAI. With the widespread use of computers in the classroom, it is important to know not only if there is an effect on achievement, but also if that effect is a positive and significant one.

It was hypothesized that CAI does have a positive effect on reading instruction in a remedial setting when it is combined with direct instruction as contrasted with direct instruction by workbook activities of a pen and paper variety.

Procedures

The subjects were ninth grade students between the ages of thirteen and sixteen. The population was primarily Black, with four Hispanic and one Vietnamese student. Samples were randomly established through routine guidance scheduling. All students scored less than 40.3 on the reading portion of the Metropolitan Achievement Test given in April 1986.

Both the control and the experimental samples were pre-tested with the High School Proficiency Test (H.S.P.T.) in October 1986.

The control sample received direct instruction in a classroom setting for five 43 minute periods per week. The skills taught followed a skills array reflecting those skills that would be on the posttest. Practice of those skills was of the traditional pen and paper method.

Students in the experimental sample received direct instruction in the classroom setting for three 43 minute periods per week and computer assissted instruction in a lab setting for two 43 minute periods per week, where the teacher and lab technician were available to answer questions and assist in both technical and skill-based problems. Students were introduced to the same skills as the control sample, but practiced those skills on the computer rather than with pen and paper. Software used was primarily provided by Prescription Learning. Additionally, supplemental commercial software was used.

Students in the experimental sample worked independently on a skill, and received upon completion of practice exercises, a Hands On test to determine mastery of that skill. If the skill was not mastered, additional practice and a teacher conference was prescribed.

At the conclusion of the experiment, both samples were tested with the H.S.P.T. and comparisons were made using the results of the posttest.

It must be noted that the method by which pretest and posttest scores were computed varied with each testing session. In a publication by NJEA (1988), it was noted that to receive a passing score of 75 in 1986, 68 correct answers were required. In 1987, only 49 correct answers were required. The reason for this being attributed to the equating of the test.

Results

At the conclusion of the experiment, pretest and posttest results of both the experimental and control samples were examined.

When results of the pretest were studied, it was found that the experimental sample, as can be seen in Table I, had a mean of 68.07 and a standard deviation of 8.40, while the control sample had a mean of 68.00 and a standard deviation of 4.55. This resulted in a non-significant t of .03.

Table I

Mean, Standard Deviation and t of the pretest of the experimental and control samples.

PRETEST	Mean	SD	t	Sig.
Exper.	68.07	8.40	.03	N.S.
Control	60.00	4.55		

The posttest results, shown in Table II indicate that the experimental sample had a mean of 75.2 and a standard deviation of 9.60, the control sample a mean of 77.2 and a standard deviation of 9.28. The t of .58, was again, not significant.

Table II

Mean, Standard Deviation and t of the posttests of the experimental and control samples.

POSTTEST	Mean	SD	t	Sig.
Exper.	75.2	9.60	.58	N.S.
Control	77.2	9.28		

The means of the samples at the time of pretest were equal, while the mean of the control sample at the time of the posttest was two points higher than that of the experimental sample.

It should be noted that because of the excessive absences of student I in the experimental sample (Appendix I), this student did not complete all work assigned, and this may have had some effect on the results.

Conclusions

It was hypothesized that CAI does have a positive effect on reading instruction in a remedial setting when it is combined with direct instruction as contrasted with direct instruction by workbook activities of a pen and paper variety.

The hypothesis was rejected because the results of the study indicated that the t of .58 in the posttest was not significant. In fact,

the control sample had a mean that was two points higher than that of the experimental sample. The difference of the means, while not statistically significant at this time, may have been more significant if more time was afforded for the study.

The results of this study may indicate a need for more research of this topic, noting that the scoring of the pretest and posttest was not identical. This variation in scoring may have altered the final results. However, since mean gains were not being compared in this case, the results of non-significant t between the means of the posttest seems valid.

The results of this study as they exist here have implications for education. Computers are becoming more prevalent in society and it is becoming necessary to be familiar with their use. Although past research, as well as the findings of this study, indicate that there is no significant benefit from their use in the instruction of reading over traditional print and paper methods, CAI may, however, be an alternate method of drill and practice.

COMPUTER ASSISTED INSTRUCTION:

RELATED RESEARCH

Initial work in Computer Assisted Instruction was begun by the Illinois PLATO Staff in 1960. In 1963, the Stanford project was the first to make use of CAI in reading at the Elementary school level. Since these studies were conducted, more research has been done on the subject of CAI in the classroom at all levels. There is still disagreement among researchers as to whether or not CAI has a positive effect on reading instruction. However, studies that have been located, while related to the topic of CAI, do not investigate the effect of CAI at the High School level in a remedial setting.

Reinking and Schreiner (1985) conducted a study to see if computer technology might influence the process of comprehension by manipulating text in ways not available on printed pages. The study was conducted with intermediate-grade good and poor readers. They hypothesized that using a computer to provide manipulations would facilitate reading comprehension. A further hypothesis was that providing options for intermediate-grade readers to interact overtly with the text would encourage more active processing of the text.

It was hoped that the computer would stimulate metacognitive activity and therefore affect comprehension.

Reinking and Schreiner (1985) state that several studies involving High School and adult readers have shown that the use of computers can affect comprehension. Anderson et al (1974), for example used a computer to regulate the independent reading of college students in economics classes. It was found that students whose comprehension was monitored by the computer scored significantly higher on final exams than those who read and studied on their own.

Mc Jonkie (1983) reported positive results in using a computer program which provides a pronunciation of unfamiliar words when touched on a computer screen. Non-literate adults using this program were able to read and understand material above their estimated instructional reading level.

In Reinking's study, (1985) the computer was used to mediate text relative to four categories of comprehension factors. Subjects were provided with definitions of key vocabulary; a simpler, less technical version of the text; supplementary background information; and passage structure in the form of a main idea for each paragraph. These options provided the readers an opportunity to interact overtly with the text.

Reinking conducted the study with 104 fifth and sixth grade students as the subjects. They were chosen from an initial pool of 364 fifth and sixth grade students in an urban intermediage-grade school. They were blocked on the basis of reading ability and assigned randomly to four experimental conditions. In each condition, subjects read six expository passages. Each passage was followed by 6 comprehension probes. A subject not correctly responding to at least four of the comprehension probes was encouraged to restudy the passage before again attempting to meet the criterion score. Three passages were classified as low difficulty and three as high difficulty on the basis of a standard readability formula.

The first group read passages off line (printed page), no textual manipulations were available.

The second group read passages on line (displayed by the computer), no textual manipulations were available.

The third group read passages on line and were free to choose from

several textual manipulations which were deemed useful for enhancing comprehension of the passages.

The fourth group read passages on line and were required by the computer program to view all available manipulations before being allowed to respond.

The groups were monitored and their comprehension was recorded. The extent to which subjects selected textual manipulations was also recorded. Good readers requested a mean of 2.3 manipulations per passage and poor readers selected a mean of 3.2 manipulations per passage. The greater number, Reinking found, can be attributed to the greater number of attempts needed to achieve a criterion score. Thus, poor readers had more opportunities to consider the selection of textual manipulations.

Data also revealed that subjects chose background manipulations more often and rereading less often than other manipulations.

Reinking's findings suggest that "The comprehension of intermediate-grade good and poor readers can be affected by providing textual manipulations mediated by a computer." Also that "Comprehension of a particular set of expository texts can be affected by variation in textual manipulations mediated by a computer. However, this effect appears to be more a function of using the computer to control reader's exposure to text manipulations rather than simply making textual manipulations available for reader selection."

It is suggested that the computer might provide unique opportunities to manage a reader's interactions with text during independent reading, and may have encouraged readers to process more deeply the meaning of the text. Additionally, the computer may have helped readers monitor their

comprehension.

Results of the study indicated that computer mediated text can influence reading comprehension and that comprehension was most consistently increased when manipulations of the text were computer controlled. The study found no evidence that limited exposure to computer mediated text in the study had any positive effect on a general measure of reading comprehension, although readers attempted to enhance their comprehension.

Wood (1985) describes a study by Smith (cs 007784), who used the word processor in her classroom. She found that the word processor allowed for rapid alteration and manipulation of the text, therefore more experimentation. Secodndly, the students were able to control the machine and therefore the text. Third, she found the word processor ideal for language experience approach to reading and writing.

Wood also discusses observations by Collins (ED 229 728) who notes that some microcomputer capabilities can be applied to reading and writing instruction, including information retrieval systems, interactive texts, automated dictionaries and thesauri, text editors, message systems and publications systems.

Work by Norton and Pesta (1985) suggests that the use of the computer throughout the curriculum represents a medium for modeling problem-solving strategies that extends beyond those modeled in an exclusively print-oriented learning environment.

This study investigated the impact of computer-based instruction in elementary students' reading performance. It investigated CAI (the use of computer as an instruction medium to provide tutorials and drill and practice of related skill areas) and CMI (use of the computer as a man-

agement information system enabling teachers to cope with record keeping and decision demands of individualized instruction.)

Rumelhart (1980) suggests that reading is a collection of problem-solving processes which students employ to relate their existing schema with new schemas presented by written texts. Miller (1985), suggests the viability of using problem-solving software to facilitate reading instruction. His research compared a control group receiving reading instruction using an integrated learning system (Prescriptive Learning), with an experimental group receiving reading instruction supported by additional microcomputer instruction using problem-solving software. Pre and post testing yielded significant differences between the two groups in both problem solving and reading comprehension. No significant within-group gains were reported for the control group.

On the other hand, Pogrow's (1985) HOTS Project suggested that very young students did not profit from the project and should be returned to traditional, non-computer based programs.

The results of Norton and Resta (1985) suggest that skills instruction alone does not represent the most effective method for reading instruction, although it may seem that for younger students, language development is a necessary pre-requisite for achievement as Pogrow (1985) suggested.

Nevertheless, the findings support the use of problem-solving software and simulation software to impact reading performance.

A study by Leton and Pertz (1984) was conducted in remedial reading classes in an urban school with first and second grade students. Students in the experimental group received automated reading with their

instruction. The control group received instruction in the same books without the automated reading. The random selection of first grade students failed to yield comparable groups, and the contrast of adjusted posttest scores was nonsignificant. The second grade groups, however, indicated significant achievement gains for the experimental group.

Levy (1984), compared the reading achievement of 300 randomly selected elementary students involved in CAI, traditional reading instruction, and prescriptive reading instruction. He suggested that for vocabulary, a traditional method was more effective and for comprehension, the traditional method combined with CAI was effective.

Julie M.T. Chan, Director of Compu-Kids, Inc. (1985) discussed the use of microcomputers as an accepted teaching tool. She feels that the "promise of the computer for students who are disabled and reluctant readers is great, provided it is used judiciously, with a specific purpose, and with the right software".

She recognizes the enthusiasm students have for working with computers and that the computer facilitates those who are primarily visual, as well as kinesthetic learners. Auditory learners are limited when using a computer because voice technology is still in its early stages and very expensive as yet.

Companies such as The Learning Company, Midwest Publications, Spinnaker and Sunburst offer software which is challenging and require higher level thinking skills, as well as branching off to more difficult or less difficult levels. Software such as this can be used for more individualized learning.

Books, stories and novels are being designed to be read before

playing a computer game. The student reads the story so that he has the background information and is aware of characters' motives, all necessary to play the game.

She states the "recent research on the use of computers for skills attainment indicate that the greatest gains are for disabled readers. Gains of as much as one to two years growth after a program of well-planned, sequential, consistent computer use for four to six months has been reported".

Two studies were done at Kean College as subjects for Master's Thesis. The first, by Isabelle M. Giordano (1985), examined how reading achievement was affected by using microcomputers with existing vocabulary development materials. In Giordano's study, there were 35 third grade students in three samples. The first sample used specific vocabulary work (sample R). The second sample used LOGO with the microcomputer (sample L), and the third sample used traditional workbook activities (sample G).

The students were compared for academic achievement in reading as assessed through results of the Iowa Test of Basic Skills.

Giordano's date revealed that the achievement of students who used microcomputers for vocabulary was not significantly different from the control sample after 12 weeks of instruction, but was apparently reaching significance. Giordano suggested the need for an extended language study.

The second study done at Kean College examined vocabulary instruction at the seventh-grade level. Alfano (1985) examined students' achievement in vocabulary development under two methods - Teacher Directed Instruction

versus Computer Assisted Instruction.

The subjects were middle class suburban-urban seventh-graders with a one to three year vocabulary deficit on the Iowa Test of Basic Skills pretest.

Two samples were set up. Sample A being the control group receiving vocabulary instruction using computer programs. The experimental sample, B received the same lessons but used the print outs from the computer as worksheets for pencil and paper activity. Twenty minutes per day was spent on the vocabulary lesson. Work done by the control group was corrected by the computer, whereas students corrected and discussed errors with the class in the experimental sample.

The results of Alfano's study indicated that there was no significant difference between the two methods of instruction. There was a slight mean difference in favor of the teacher-directed sample. The teacher-directed sample seemed to be more enjoyable to the students. Alfano raised the question of whether or not this could be a result of the teacher-student interaction.

Balajthy (1986) acknowledges the need for teacher training in computer applications. He sees the use of computers in the schools as supplemental "tutor, tool ant tutee". They are used as tutors for reinforcement and practice of concepts and skills taught by human teachers rather than for primary instruction.

He feels that teachers must be knowledgeable of making informed evaluations of software and methods of organizing microcomputer instruction in order to integrate it into the traditional curriculum.

After examining the studies done with CAI, I am in agreement with

researchers who suggest that more investigation of the topic can be necessary. Does CAI have a positive effect? If so, at what age and with what type of student?

The research indicates that CAI at very low grade levels has no positive effects and may even have negative effects. However at higher grade levels it seems to indicate that use of the computer helps to stimulate interest in the reading process, and that students involved with computers become more inquisitive, and develop problem solving skills which, as Norton and Resta suggested, improves comprehension.

At the upper grade level, many of the problems students face with comprehension do not stem from word identification and word meaning, but with higher level skills such as synthesis and application. If those skills can be developed with the help of computers, then it would appear that students' comprehension will causally increase.

Interest in computer use is at a peak and, thus, it appears desirable that this interest should be tapped and put to use for the benefit of the students.

REFERENCES

References

Alfano, JoAnn L. (1985). Seventh Grade Vocabulary - Computer Instruction vs. Classroom Instruction. Unpublished Thesis, Kean College of New Jersey, Union.

Balajthy, Ernest. (1986). A preservice training module in microcomputer applications for teaching reading. Journal of Reading, 196-199.

Blanchard, Jay S., Mason, George E., and Daniel, Dan. (1987). Computer Applications in Reading. Newark, Delaware: International Reading Association.

Chan, Julie M.T. (1983). What micros do for reading Comprehension. The Reading Teacher, 36 #7, 692-693.

Chan, Julie M.T. (1985). The Promise of Computers for Reluctant Readers. Library Journal, 110: 132-142.

Dudley Marling, Curtis C. (1985). Microcomputers, reading and writing: Alternatives to drill and practice. The Reading Teacher, 38 #4, 388-391.

Giordano, Isabelle M. (1985). How Existing Vocabulary Development Materials Using Microcomputers Affect Reading Achievement. Unpublished thesis, Kean College of New Jersey, Union.

The Learning Co. 545 Middlefield Rd., Suite 170, Menlo Park, CA 94025.

Leton, Donald A., and Pertz, Dorothy A. (1984). The Use of Computer-Automated Reading in Reading Instruction. Psychology in the Schools, vol. 21, 512-515.

Lysiak, Fae., Wallace, Sherry., and Evans, Charles. (1976). Computer-Assisted Instruction. ED 140 495. Arlington, VA. ERIC Document Reproduction Service.

Marsh, Merle. (1983). Computer assisted instruction in reading. Journal of Reading, 26, 697-701.

Miller, J. (1985). The Effect of Computer Assisted Problem-Solving Instruction on the Academic Achievement of Elementary Students. Unpublished Doctoral Dissertation. San Diego, CA: United States International University.

NJEA Review. (March 1988). HSPT to become top secret in 1989. P. 7.

Norton, Priscilla. and Resta, Virginia, (1986). Investigating the Impact of Computer Instruction on Elementary Students' Reading Achievement. Educational Technology,, 35-41.

Pogrow, S. (1985). Helping Students Become Thinkers. Electronic Learning, 4(7).

Prescription Learning, (1984). Springfield, Illinois P.O. Box 2377-62705.

Reinking, David. and Schreiner, Robert. (1985). The effects of computer-mediated text on measures of reading comprehension and reading behavior. Reading Research Quarterly, 20, 536-552.

Rumelhart, D.E., (1980). Schemata: The Building Blocks of Cognition. Hillsdale, NJ: Lawrence Erlbaum Associates.

Shaftel, Fannie. (1967). Personal Communication. Reading Research Quarterly, 20, 536-552.

Simon, Herbert A. (1983). Computer Education: Realizing the Potential. American Education, 19 #10, 17-23.

Spache, George D. (1967-68). "A Reaction to Computer-Assisted Instruction in Initial Reading: The Stanford Project." Reading Research Quarterly, vol. 3, 101-110.

Spinnaker Software Corp.. One Kendal Square, Cambridge, MA 02139.

Sunburst Communications. 39 Washington Ave., Pleasantville, NY 10570.

Wedman, Judy. (1983). Are the Software Scales Properly Balanced? Media and Methods, 19 #10, 25-27.

Wood, Bruce. (1985). Computers and reading at the secondary school, college and adult levels. Journal of Reading, 28:8, 750-752.

Yeager, Robert. (1977). Lessons Learned in the PLATO Elementary Reading Curriculum Project. ED 139 966 Arlington, Va.: ERIC Document Reproduction Service.

APPENDICES

Appendix I

Experimental sample - pretest and posttest results.

Student	Pretest	Posttest	pt. gain
A	70	84	+14
B	69	63	-6
C	73	85	+12
D	74	89	+15
E	68	71	+3
F	56	69	+13
G	71	82	+11
H	73	74	+1
I	70	56	-14
J	72	83	+11
K	74	82	+8
L	68	78	+10
M	71	70	-1
N	70	79	+9
O	42	63	+21

Appendix II

Control sample - pretest and posttest results.

Student	Pretest	Posttest	pt. gain
A	73	86	+13
B	63	57	-6
C	72	82	+10
D	66	67	+1
E	60	75	+15
F	74	90	+16
G	69	76	+7
H	70	78	+8
I	63	78	+15
J	70	78	+8
K	62	76	+14
L	72	89	+17
M	68	77	+9
N	73	86	+13
O	65	63	-2

Appendix III

Skills Array, HSPT Reading Specifications

LITERAL COMPREHENSION / VOCABULARY

A. Identify word meaning from multiple meanings
B. Identify Synonyms
C. Differentiate between relevant and irrelevant information
D. Identify main idea of a passage
E. Identify details that support main idea
F. Identify comparisons (similarities)
G. Identify contrasts (differences)
H. Identify cause and effect relationships
I. Identify events in a sequence
J. Identify meaning of unfamiliar words from context
K. Identify appropriate word meaning by affixes

INFERENTIAL COMPREHENSION / VOCABULARY

A. Infer the main idea
B. Predict the outcome
C. Draw a conclusion
D. Infer a character's motives
E. Infer a writer's purpose/viewpoint
F. Distinguish between fact and opinion
G. Interpret figurative language (idioms, similies, metaphors)
H. Infer sequence time order
I. Infer cause and effect relationships
J. Infer comparisons
K. Infer contrasts
L. Synthesize information
M. Make judgments

STUDY SKILLS

A. Complete outline by selecting topic/detail
B. Use catalog cards to locate information
C. Use Readers' Guide to Periodical Literature
D. Identify appropriate encyclopedia heading to find more information
E. Select words from specific dictionary page
F. Locate information in an index
G. Interpret data presented in visual form
H. Locate information from table of contents